CLAIMS

1. A method of detecting radiation including the steps of providing a layer of high purity single crystal CVD diamond, applying an electric field of no greater than 0.5 V/µm to the layer, exposing the layer to the radiation thereby generating a signal and detecting the signal.

2. A method according to claim 1 wherein the electric field which is applied to the diamond layer is less than 0.3 V/µm.

3. A method according to claim 1 wherein the electric field which is applied to the diamond layer is less than 0.2 V/µm.

4. A method according to claim 1 wherein the electric field which is applied to the diamond layer is less than 0.15 V/µm.

5. A method according to any one of claims 1 to 4 wherein the thickness of the layer does not exceed 1 mm.

6. A method according to any one of claims 1 to 4 wherein the thickness of the layer is less than 500 µm.

7. A method according to any one of claims 1 to 4 wherein the thickness of the layer is less than 250 µm.

8. A method according to any one of claims 1 to 7 wherein a bias voltage less than 300 V is applied to the layer.

9. A method according to any one of claims 1 to 7 wherein a bias voltage less than 200 V is applied to the layer.

10. A method according to any one of claims 1 to 7 wherein a bias voltage less than 100 V is applied to the layer.

11. A method according to any one of claims 1 to 7 wherein a bias voltage less than 75 V is applied to the layer.

12. A method according to any one of the preceding claims wherein the CVD diamond layer reaches at least 80% of the saturated charge collection efficiency at the applied electric field.

13. A method according to any one of claims 1 to 11 wherein the CVD diamond layer reaches at least 90% of the saturated charge collection efficiency at the applied electric field.

14. A method according to any one of claims 1 to 11 wherein the CVD diamond layer reaches at least 95% of the saturated charge collection efficiency at the applied electric field.

15. A method according to any one of the preceding claims wherein the CVD diamond is capable of generating at least 7000 electrons per detection event for minimum ionising particles when operated at the applied electric field.

16. A method according to any one of claims 1 to 14 wherein the CVD diamond is capable of generating at least 9000 electrons per detection event for minimum ionising particles when operated at the applied electric field.

17. A method according to any one of claims 1 to 14 wherein the CVD diamond is capable of generating at least 12000 electrons per detection event for minimum ionising particles when operated at the applied electric field.

18. A method according to any one of claims 1 to 14 wherein the CVD diamond is capable of generating at least 15000 electrons per detection event for minimum ionising particles when operated at the applied electric field.

19. A method according to any one of the preceding claims wherein the radiation is alpha particles and the CVD diamond is such that it generates a peak width (FWHM) in energy, expressed as $\delta E/E$, less than 20%.

20. A method according to any one of the preceding claims wherein the radiation is selected from beta particles, alpha particles, protons, other high energy nuclear particles and high energy electromagnetic radiation.

21. A method according to any one of claims 1 to 19 wherein the radiation is neutrons.

22. A detector for use in a method according to any one of the preceding claims comprising a layer of high purity single crystal CVD diamond.

23. A detector according to claim 22 wherein the layer of high purity single crystal CVD diamond is a thin layer.

24. A detector according to claim 22 or claim 23 wherein the layer of high purity single crystal CVD diamond has a thickness of less than 1 mm.

25. A detector according to any one of claims 22 to 24 for use in a stand-alone, remote or hand-held device.